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EXAMINER	
BERDICHEVSKY, MIRIAM	
ART UNIT	PAPER NUMBER
1723	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/574,378	GEYER ET AL.	
	Examiner	Art Unit	
	MIRIAM BERDICHEVSKY	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *rce 6/9/2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26 and 29-44* is/are pending in the application.

4a) Of the above claim(s) *1-15,39 and 40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-26,29-38 and 41-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remarks

Claims 1-15 and 39-40 are withdrawn. Claim 16 is amended. Claims 16-26, 29-38 and 41-44 are currently pending.

Status of Rejections

All rejections from the previous office action are withdrawn in view of Applicant's amendments.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 16-26, 29-30, 32-36, 38 and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (EP 0940860), Probst (US 5626688), Wendt (US 6310281), Levine (US 4407320) and Yoshikawa (US 6586670).

As to claim 16, Nakata teaches a spherical solar cell comprising an insulating substrate core coated with a back contact layer and a CIS compound semiconductor ([0011], [0076] and [0077]). Nakata teaches that the substrate core may be an insulating material, preferably transparent, with a thermal expansion coefficient close to the thermal expansion coefficient of the semiconductor thin film layer wherein the core does not need to be a high grade material thereby greatly reducing costs ([0011]). However, Nakata is silent to the particulars of the spherical solar cell materials when the solar cell has a CIS absorber layer and is therefore silent to the substrate core being glass, contact layer being Mo and a CdS buffer layer.

Probst teaches a conventional CIS solar cell comprising a soda lime glass substrate (col. 5, line 5), a Mo back contact layer (col. 5, lines 10-15) with a CdS and a ZnO buffer layer (col. 8, lines15-30). Wendt teaches that the majority of CIS thin-film layers are deposited on glass because glass is cost effective and has a good coefficient of thermal expansion match with CIS layers (col. 2, lines 15-25). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the materials of Probst in making the spherical CIS solar cell with a glass substrate core, a Mo contact layer because Probst teaches an improved CIS solar cell (col. 5, lines 1-5) wherein glass is transparent, cost effective and has a thermal expansion coefficient close to (match) the CIS semiconductor thin film, as taught by Wendt (col. 2, lines 15-25) and desired by Nakata ([0011]) especially since it has been held to be within the skill of a worker to select a known material based on its suitability for the intended use (MPEP 2144). Modified Nakata teaches that the spherical semiconductors can be

connected in the same manner seen in the prior art (Nakata: [0077]) but Nakata and Probst remain silent to the particulars of spherical semiconductor arrangement and electrical connection on a larger scale.

Levine teaches a device comprising an insulating support layer (101) in which conductive elements are incorporated in a pattern (111) wherein the conductive elements protrude from the surface of the support layer and the patterns define at least one separation line having width B (107s) (figure 1), a plurality of spherical semiconductor elements (110) protruding from the surface of the support layer and form a pattern in the areas next to the separation line (figure 1), a conductive front contact layer (103), a conductive back layer on the side opposite the first conductive layer (105), a first separation cut made in the front contact layer and a second separation cut made in the back contact layer which penetrates the back contact layer all the way through to the support layer, the separation cuts being on different sides of the row of conductive elements (figures 1 and 5: where 51 represents 103,105 and 52 represents 111 in an alternative embodiment). As a result of the combination, on the side of the support layer on which the back contact layer of the solar cell is arranged the semiconductor elements have back contacts in direct contact with the back contact layers of Levine. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the arrangement of Levine in modified Nakata to produce a series/parallel interconnected array of solar cells because Levine teaches that the structure provides a large area array converter utilizing minimum semiconductor material, flexibility without

damage as a thin sheet, short circuit tolerance and series interconnection during array manufacturing with very little additional cost, as taught by Levine (col. 1, lines 45-60).

Finally, modified Nakata is silent to the front contact layer being a TCO (claim 28). Yoshikawa teaches that aluminum (used throughout Nakata as electrically conductive material), copper and TCOs are art recognized equivalent conductive materials in the solar arts (col. 16, lines 25-55). It would have been obvious to one of ordinary skill to try using TCOs as conductive components of modified Nakata with a reasonable expectation of success and similar results, i.e. conductivity (MPEP 2141) especially since it has been held to be within the skill of a worker in the art to select a known material based on its suitability for an intended use (MPEP 2144).

Regarding claims 17-18, modified Nakata teaches that the support layer is a polyester, thermoplastic (Levine: col. 3, lines 15-16).

Regarding claim 19, the limitation is a product by process claim and is not given significant patentable weight because even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113).

Regarding claim 20, modified Nakata teaches a spherical conductive element (Levine: 111, figure 1).

Regarding claim 21, modified Nakata teaches that the conductive material is a solid (Levine: col. 3, lines 19-21).

Regarding claim 22, modified Nakata is silent to the conductive element being copper. Yoshikawa teaches that aluminum (used throughout Nakata as electrically conductive material), copper and TCOs are art recognized equivalent conductive materials in the solar arts (col. 16, lines 25-55). It would have been obvious to one of ordinary skill to try using copper as a conductive component of modified Nakata with a reasonable expectation of success and similar results, i.e. conductivity (MPEP 2141) especially since it has been held to be within the skill of a worker in the art to select a known material based on its suitability for an intended use (MPEP 2144).

Regarding claim 23, modified Nakata teaches a TCO layer as part of the semiconductor element (Probst: col. 8, lines 20-30).

Regarding claim 24, modified Nakata teaches that the separation line of conductive elements is essentially straight and extends between two edges of the support layer opposite from one another (Levine: figures 1 and 5).

Regarding claims 25 and 41, modified Nakata is silent to the specific dimensions of the interconnection (separation line) and is therefore silent the limitations requiring a width of the separation line to be of a certain magnitude of ranges. The dimensions of a conducting element (interconnection/separation line) are result effective variables. It is well known that resistance is dependent on length such that resistance increases with length (in this case termed width) between connected elements. One of ordinary skill in the art at the time of the invention would have found it obvious to optimize the width of

the separation line by trying different widths with a reasonable expectation of success of similar results (MPEP 2144 and 2141).

Regarding claims 26, 34 and 42-43, modified Nakata is silent to the specific dimensions of the interconnection (separation line) and is therefore silent the limitations requiring a distance between separation lines of a certain magnitude of ranges. The distance between separation lines or the distance containing semiconductor conversion elements is a result effective variable and a design choice. As the distance available for electrical conversion increases output increases however material costs increase. It would have been obvious to one of ordinary skill in the art at the time to optimize the amount of area dedicated to conversion depending on output required for a specific job and funds/materials available by trying different distances between separation lines with a reasonable expectation of similar results (MPEP 2144 and 2141).

Regarding claim 29, modified Nakata teaches that the back contact layer is metal (col. 3, lines 5-10).

Regarding claim 30, modified Nakata teaches that the back contact layer is aluminum (col. 4, lines 50-55).

Regarding claim 32, modified Nakata teaches that the separation cuts are filled with insulating material (Levine: figure 5).

Regarding claim 33, modified Nakata teaches that the serial connection is strip-like (Levine: figures 1 and 5).

Regarding claim 35, modified Nakata teaches that the serial connection is joined in such a way that the back contact layer is in contact with a front contact layer of the other serial connection (Levine: figure 5).

Regarding claim 36, modified Nakata teaches that the serial connection is joined to at least another serial connection in shingle like configuration, whereby the front contact layer lies on a back contact layer of the other serial connection (Levine: figure 5).

Regarding claim 38, modified Nakata teaches a photovoltaic module (Levine: title).

4. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata, Probst, Wendt, Levine and Yoshikawa as applied to claim 30 above and further in view of Hogel (US 4913744).

Regarding claim 31, modified Nakata is silent to the back contact layer being an intrinsic conductive polymer. Hogen teaches that aluminum (used throughout Nakata as electrically conductive material) and intrinsic conductive polymers are art recognized equivalent conductive materials in the solar arts (col. 8, lines 40-55). It would have been obvious to one of ordinary skill to try using an intrinsic conductive polymer as the back conductive layer in modified Nakata with a reasonable expectation of success and similar results (MPEP 2141) especially since it has been held to be within the skill of a worker in the art to select a known material based on its suitability for an intended use (MPEP 2144).

5. Claims 37 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata, Probst, Wendt, Levine and Yoshikawa as applied to claims 35 and 36 respectively above and further in view of Tsuzuki (US 5679176).

Regarding claims 37 and 44, modified Nakata is silent to a conductive adhesive connecting the front and back conductive layers in the serial connection. Tsuzuki teaches the use of a conductive adhesive (solder) for creating the serial connection between conductive layers (upper/lower electrodes) of solar devices (col. 3, lines 45-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to connect the conductive layers of modified Nakata using a conductive adhesive when forming the serial connection because the method allows for on site adaptability by connecting separate parts rather than preformed modules.

Response to Arguments

Applicant's arguments filed 6/9/2011 have been fully considered but they are not persuasive.

Applicant argues that one of ordinary skill in the art would not have recognized TCOs as art recognized equivalent conductive materials for the arrangement of Levine because metal foils are malleable whereas TCO layers are fragile and brittle and therefore not conducive to use in the flexible configuration of Levine. The mere allegation that TCOs are not capable of use in flexible solar application is not persuasive. In fact, Kuo (US 5356656) teaches a flexible solar cell which comprises a transparent conductive oxide film on a flexible substrate (col. 1, lines 10-20) demonstrating that TCOs are capable of use in flexible applications such as the Levine

configuration. Thus the Examiner respectfully disagrees. In response to Applicant's argument that copper, aluminum and TCOs have differing electrical properties, Yoshikawa recognizes a difference between electrical resistivity among electrically conductive materials however, despite the differences between the materials Yoshikawa teaches that the three materials are suitable as electrical conductors (col. 16, lines 25-55) wherein selection of a material and its associated conductivity is within the skill of a worker in the art with predictable results (MPEP 2144). In response to applicant's argument that increased light gathering due to transparent materials is not explicitly stated in the art, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Yoshikawa acknowledges that the light irradiated side (front contact layer) of a solar cell preferably has a transparent conductive support, specifically to light for which the photosensitive layer is sensitive (col. 16, lines 45-57) because one would appreciate that increased light presence increases potential for conversion by the photoactive material.

Applicant argues that Probst teaches away from use of glass core substrates by expressing poor adhesion between flat glass and Mo contact layers such that a spherical glass core would not have been obvious at the time of the invention. The Examiner respectfully disagrees. Probst teaches that poor adhesion was a problem (col. 2, lines 4-6) but that the method of Probst avoids the problem of deteriorated adhesion between layers encountered previously (col. 2, lines 35-40. It would have

been obvious to one of ordinary skill in the art at the time of the invention to use a glass core substrate in modified Nakata because glass is cheaper than high grade semiconductors, has a matching coefficient of thermal expansion to that of CIS layers and through the method of Probst avoids the poor adhesion problem of the prior art, as taught by Nakata ([0011]), Probst (col. 2, lines 4-6 and 35-40) and Wendt (col. 2, lines 15-25).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 10am-8pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MIRIAM BERDICHEVSKY/
Examiner, Art Unit 1723